HTM12864-8

LCD Module User Manual

Shenzhen HOT Display Technology Co., Ltd.

Rev.	Descriptions	Date
01	Prelimiay Release	2007-05-11

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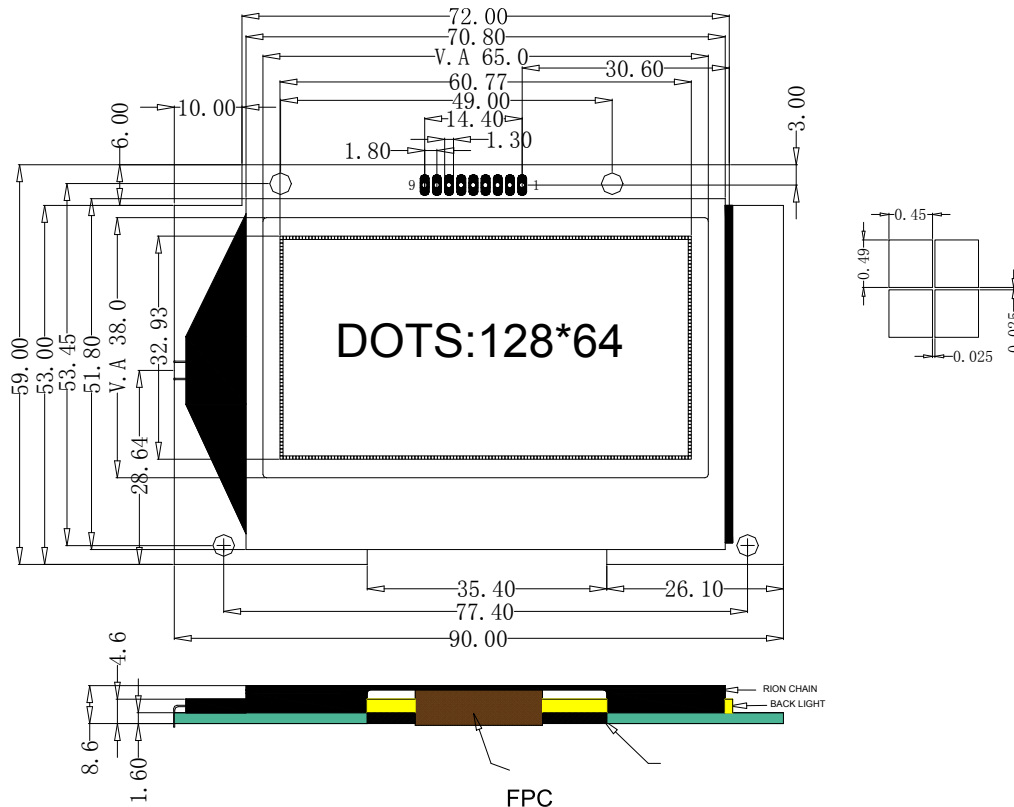# 1. Basic Specifications

1.1 Display Specifications

    1>LCD Display Mode   : STN, Positive, Yellow-Green,Transmissive

    2>Viewing Angle   : 6H

    3>Driving Method   : 1/64 Duty, 1/9 Bias

    4 >Backlight   : Yellow Green

1.2 Mechanical Specifications

1>Outline Dimension   : 90.0X59.0 X8.6mm (See attached Outline Drawing for Deta)

1.3 Circuit Diagram
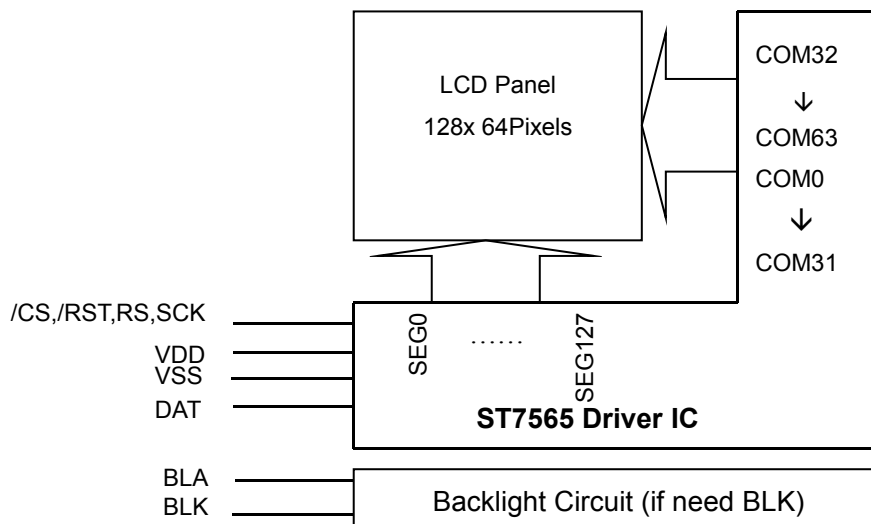
1.4 Terminal Function

Pin No.	Pin Name	Function
1	/CS	Chip selection input
2	/RET	Reset Signal input
3	D/C	Data/Command control input
4	SCLK	Serial Input Clock (SCLK)
5	DATA	Serial Input Data (SID)
6	VSS	LCD Negtive(VSS)
7	VDD	LCD Positive(3.3V)
8	A(BLA)	Bcaklight Positive(3.3V)
9	K(BLK)	Bcaklight Negtive(VSS)

NOTE:

Resister Ra,Rb,Rc in the Blck of PCB is 515,394,105(not using internal regulator resistors)

2. Absolute Maximum Ratings

Items	Symbol	MIN.	MAX.	Unit	Condition
Supply Voltage	V_{DD}	-0.3	+3.3	V	V_{SS} = 0V
	Vlcd	-0.3	+17.0	V	V_{SS} = 0V
Input Voltage	V_{IN}	-0.3	V_{DD}+0.3	V	V_{SS} = 0V
Operating Temperature	T_{OP}	-10	+60	℃	No Condensation
Storage Temperature	Tst	-20	+70	℃	No Condensation

3. Electrical Characteristics

3.1 DC Characteristics

(V_{SS} = 0V, V_{DD} = 2.4 to 3.6V, Ta = -40~85°C)

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Operating Voltage(1)	V_{DD}	2.4	-	3.6	V	
Operating voltage (2)	V0	4.5	-	15	V	
Input High Voltage	V_{IH}	0.8 x V_{DD}	-	V_{DD}	V	
Input Low Voltage	V_{IL}	V_{SS}	-	0.2 x V_{DD}	V	
Output High Voltage	V_{OH}	0.8 x V_{DD}	-	V_{DD}	V	I_{OH} = -0.5mA
Output Low Voltage	V_{OL}	V_{SS}	-	0.2 x V_{DD}	V	I_{OL} = 0.5mA
Input Leakage Current	I_{LI}	-1.0	-	1.0	µA	V_{IN} = V_{DD} or V_{SS}
Output Leakage Current	I_{Lo}	-3.0	-	+3.0	µA	V_{IN} = V_{DD} or V_{SS}

Items	Symbol	Condition	Min.	Typ.	Max.	Unit	Condition
Voltage converter circuit output voltage	VOUT	×3 / ×4 / ×5 / ×6 voltage conversion	95	99	-	%	VOUT
Voltage regulator circuit operating voltage	VOUT		6.0	-	16.0	V	VOUT
Voltage follower circuit operating voltage	V0		4.5	-	15.0	V	V0 *8
Reference voltage	VREF	Ta = 25°C	1.94	2.00	2.06	V	*10

3.2 AC Characteristics

Serial Interface Characteristics
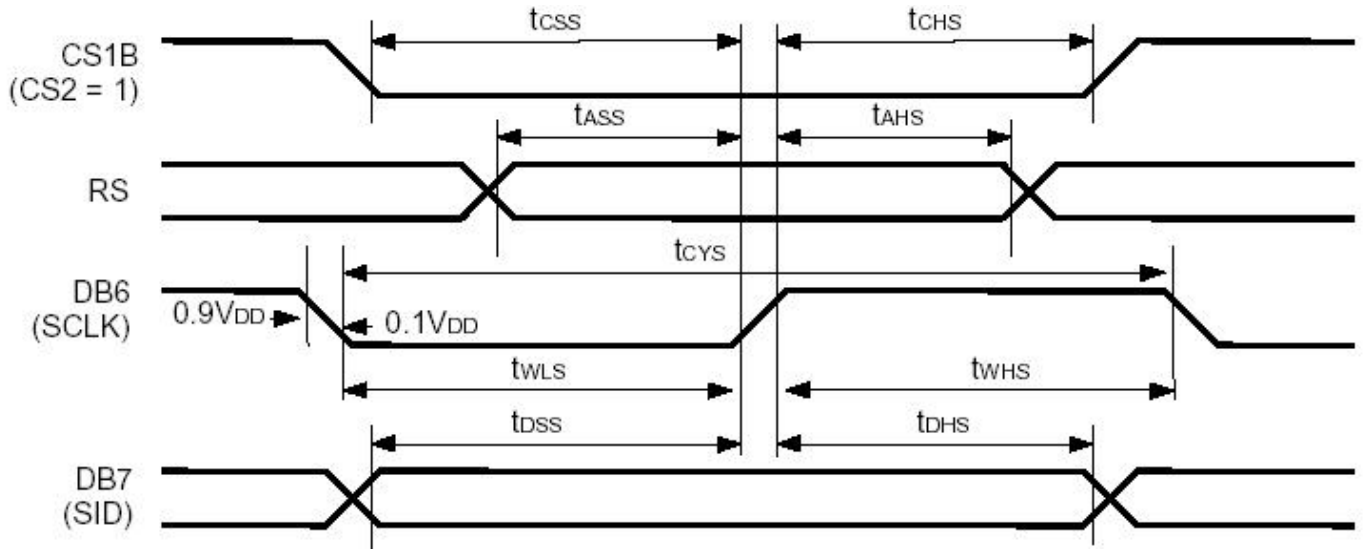
$(V_{DD} = 2.4 \sim 3.6V, Ta = -40 \sim +85°C)$

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Serial clock cycle	Tcyc8	250	-	-	ns	-
SCLK high pulse width	Twhs	100	-	-	ns	
SCLK low pulse width	Twls	100	-	-	ns	
Address setup time(A0)	Taw8	150	-	-	ns	-
Address hold time(A0)	Tah8	150	-	-	ns	-
Data steup time	Tds8	100	-	-	ns	-
Data hold time	Tdh8	100	-	-	ns	-

3.3 Resret Timing
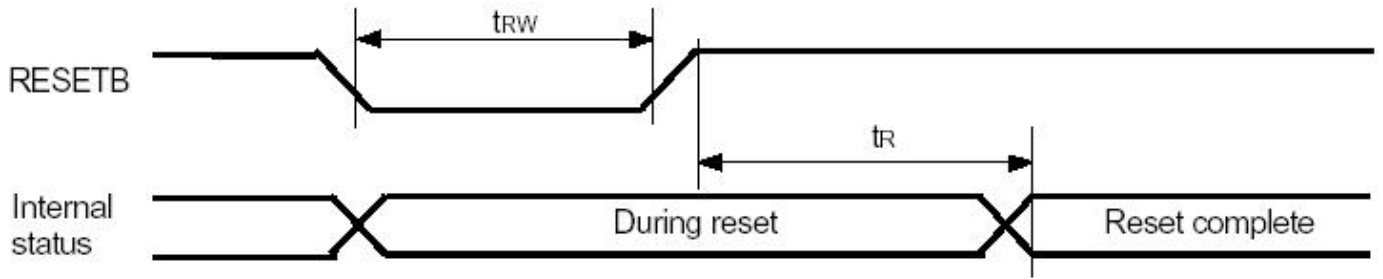
(V$_{DD}$ = 2.4 ~ 3.6V, Ta = -40 ~ +85°C)

Items	Symbol	MIN.	TYP.	MAX.	Unit	Condition
Reset time	Tr	-	-	1.0	nS	-
Reset Low pules width	Trw	1.0	-	-	nS	-

4. Function specifications

4.1 The Parallel Interface

Shared			
RS	SCK	DAT(1 bit)	
L	L→H	H/L	Write Command data
H	L→H	H/L	Writes the display data

4.2 Basic Setting

To drive the LCD module correctly and provide normally display, please use the following seting

1> ADC = 0 (normal)
2> SHL select = 0(normal)
3> LCD Bias Select = 1/9
4> Initial Display Line = 0
5> Reverse Display ON/OF = OFF(normal)
6> Set Power Control Set:
   Voltage follower = ON,voltage converter = ON,Voltage regulator = ON
7> Display ON/OF =ON

4.3   Resetting the LCD module

The LCD module should be initialized bu using /RES terminal.
While turning on the VDD and VSS power supply, maintain /RES terminal at LOW level, After the
Power supply stabilized, release the reset terminal(/RES = High)

4.4 Display Commands

×: Don't care

Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
Display ON / OFF	0	0	1	0	1	0	1	1	1	DON	Turn on/off LCD panel When DON = 0: display OFF When DON = 1: display ON
Initial display line	0	0	0	1	ST5	ST4	ST3	ST2	ST1	ST0	Specify DDRAM line for COM0
Set page address	0	0	1	0	1	1	P3	P2	P1	P0	Set page address
Set column address MSB	0	0	0	0	0	1	Y7	Y6	Y5	Y4	Set column address MSB
Set column address LSB	0	0	0	0	0	0	Y3	Y2	Y1	Y0	Set column address LSB
Read status	0	1	BUSY	ADC	ON/OFF	RESETB	0	0	0	0	Read the internal status
Write display data	1	0	Write data								Write data into DDRAM
Read display data	1	1	Read data								Read data from DDRAM
ADC select	0	0	1	0	1	0	0	0	0	ADC	Select SEG output direction When ADC = 0: normal direction (SEG0→SEG131) When ADC = 1: reverse direction (SEG131→SEG0)
Reverse display ON / OFF	0	0	1	0	1	0	0	1	1	REV	Select normal / reverse display When REV = 0: normal display When REV = 1: reverse display
Entire display ON / OFF	0	0	1	0	1	0	0	1	0	EON	Select normal/entire display ON When EON = 0: normal display. When EON = 1: entire display ON
LCD bias select	0	0	1	0	1	0	0	0	1	BIAS	Select LCD bias
Set modify-read	0	0	1	1	1	0	0	0	0	0	Set modify-read mode
Reset modify-read	0	0	1	1	1	0	1	1	1	0	release modify-read mode
Reset	0	0	1	1	1	0	0	0	1	0	Initialize the internal functions
SHL select	0	0	1	1	0	0	SHL	×	×	×	Select COM output direction When SHL = 0: normal direction (COM0→COM63) When SHL = 1: reverse direction (COM63→COM0)
Power control	0	0	0	0	1	0	1	VC	VR	VF	Control power circuit operation
Regulator resistor select	0	0	0	0	1	0	0	R2	R1	R0	Select internal resistance ratio of the regulator resistor
Set reference voltage mode	0	0	1	0	0	0	0	0	0	1	Set reference voltage mode
Set reference voltage register	0	0	×	×	SV5	SV4	SV3	SV2	SV1	SV0	Set reference voltage register
Set static indicator mode	0	0	1	0	1	0	1	1	0	SM	Set static indicator mode
Set static indicator register	0	0	×	×	×	×	×	×	S1	S0	Set static indicator register
Power save	-	-	-	-	-	-	-	-	-	-	Compound Instruction of display OFF and entire display ON
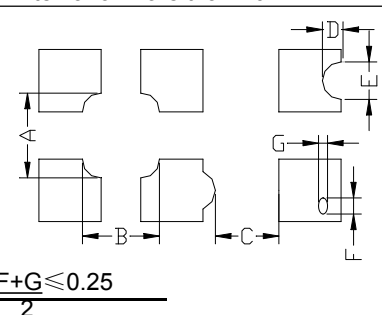
Instruction	RS	RW	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Description
NOP	0	0	1	1	1	0	0	0	1	1	*Non-Operation command*
Test Instruction_1	0	0	1	1	1	1	×	×	×	×	*Don't use this instruction*
Test Instruction_2	0	0	1	0	0	1	×	×	×	×	*Don't use this instruction*

4.5 Basic Operating Sequence

4.5.1 Initialization Sequence

	Code Function										Note
	A0	D7	D6	D5	D4	D3	D2	D1	D0	hex	
Turn on Power Supply VDD & VSS While maintaining /RES at LOW	-	-	-	-	-	-	-	-	-	-	-
Wait until power supply is stabilized	-	-	-	-	-	-	-	-	-	-	-
Release the /RES Reset Signal (/RES = High)	-	-	-	-	-	-	-	-	-	-	-
Soft Restes	0	1	0	1	0	0	0	1	1	E2H	Initialize the internal functions
Set LCD BAIS	0	0	1	0	1	0	1	1	1	A3H	SET LCD BAIS= 1/9
ADC=0	0	1	1	0	1	0	0	1	0	A1H	ADC=0 Frome S0->S127(A0 OR A1)
SET SHL	1	0	0	0	0	1	0	1	1	C0H	SHL=0 Frome C0->C63(C1 OR C0)
Power control	0	1	0	1	0	0	1	1	1	2CH	V/F ON
Power control	0	1	0	1	0	0	1	1	1	2EH	V/R ON
Power control	0	1	0	1	0	0	1	1	1	2FH	V/F ON
Select regulator resistor	0	1	0	1	0	0	1	1	1	27H	Cursory Adjust
Set reference voltage mode	0	1	0	1	0	0	1	1	1	81H	
Regulator resistor select	0	1	0	1	0	0	1	1	1	23H	Tiny Adjust
Display ON	0	1	0	1	0	0	1	1	1	AFH	
Set page address	0	1	0	1	1	P3	P2	P1	P0	B0H	Set page address (Frome Page 0)
Set column address MSB	0	1	0	0	1	0	Y7	Y6	Y5	10H	Set start column MSB
Set column address LSB	0	0	0	0	Y4	Y3	Y2	Y1	Y0	00H	Set start column LSB(Frome column 0)
Display Data	0	-	-	-	-	-	-	-	-	xxH	

5. Inspection Standards

Item	Criterion for defects	Defect type
1) Display on inspection	(1)　Non display　　　　(2) Vertical line is deficient (3)　Horizontal line is deficient　(4) Cross line is deficient	Major
2) Black／White spot	Size　Φ(mm)　　　Acceptable number 　$\Phi\leqslant0.3$　　　　Ignore (note) 　$0.3<\Phi\leqslant0.45$　　　3 　$0.45<\Phi\leqslant0.6$　　　1 　$0.6<\Phi$　　　　　　0	Minor
3) Black／White line	Length (mm)　Width (mm)　Acceptable number 　$L\leqslant10$　　$W\leqslant0.03$　　Ignore 　$5.0\leqslant L\leqslant10$　$0.03<W\leqslant0.04$　3 　$5.0\leqslant L\leqslant10$　$0.04<W\leqslant0.05$　2 　$1.0\leqslant L\leqslant10$　$0.05<W\leqslant0.06$　2 　$1.0\leqslant L\leqslant10$　$0.06<W\leqslant0.08$　1 　$L\leqslant10$　$0.08<W$　　follows 2) point defect Defects separate with each other at an interval of more than 20mm	Minor
4) Display pattern	 $\dfrac{A+B\leqslant0.28}{2}$ $\mid$ $0<C$ $\mid$ $\dfrac{D+E\leqslant0.25}{2}$ $\mid$ $\dfrac{F+G\leqslant0.25}{2}$ Note: 1) Up to 3 damages acceptable 　　　2) Not allowed if there are two or more pinholes every three-fourth inch.	Minor
5) Spot-like contrast irregularity	Size　Φ(mm)　　　Acceptable Number 　$\Phi\leqslant0.7$　　　　Ignore (note) 　$0.7<\Phi\leqslant1.0$　　　3 　$1.0<\Phi\leqslant1.5$　　　1 　$1.5<\Phi$　　　　　0 Note: 1) Conformed to limit samples. 　　　2) Intervals of defects are more than 30mm.	Minor
6) Bubbles in polarizer	Size　Φ(mm)　　　Acceptable Number 　$\Phi\leqslant0.4$　　　　Ignore (note) 　$0.4<\Phi\leqslant0.65$　　　2 　$0.65<\Phi\leqslant1.2$　　　1 　$1.2<\Phi$　　　　　0	Minor
7) Scratches and dent on the polarizer	Scratches and dent on the polarizer shall be in the accordance with "2) Black/white spot", and "3) Black/White line".	Minor
8) Stains on the surface of LCD panel	Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning.	Minor
9) Rainbow color	No rainbow color is allowed in the optimum contrast on state within the active area.	Minor
10) Viewing area encroachment	Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.	Minor
11) Bezel appearance	Rust and deep damages that are visible in the bezel are rejected.	Minor
12) Defect of land surface contact	Evident crevices that are visible are rejected.	Minor
13) Parts mounting	(1)　Failure to mount parts (2)　Parts not in the specifications are mounted (3)　For example: Polarity is reversed, HSC or TCP falls off.	Minor
14) Part alignment	(1)　LSI, IC lead width is more than 50% beyond pad outline. (2)　More than 50% of LSI, IC leads is off the pad outline.	Minor
15) Conductive foreign matter (solder ball, solder hips)	(1)　$0.45<\Phi$, $N\geqslant1$ (2)　$0.3<\Phi\leqslant0.45$, $N\geqslant1$, Φ: Average diameter of solder ball (unit: mm) (3)　$0.5<L$, $N\geqslant1$, L: Average length of solder chip (unit: mm)	Minor
16) Bezel flaw	Bezel claw missing or not bent	Minor
17) Indication on name plate (sampling indication label)	(1)　Failure to stamp or label error, or not legible.(all acceptable if legible) (2)　The separation is more than 1/3 for indication discoloration, in which the	Minor

	characters can be checked.	

6. Handling Precautions

6.1 Mounting method

A panel of LCD module made by our company consists of two thin glass plates with polarizers that easily get damaged.

And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board (PCB), extreme care should be used when handling the LCD modules.

6.2 Cautions of LCD handling and cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

-Isopropyl alcohol

-Ethyl alcohol

-Trichlorotriflorothane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

-Water

-Ketene

-Aromatics

6.3 Caution against static charge

The LCD module use C-MOS LSI drivers. So we recommend you:

Connect any unused input terminal to V_{dd} or V_{ss}. Do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

6.4 Packaging

-Module employs LCD elements, and must be treated as such. Avoid intense shock and falls from a height.

-To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

6.5 Caution for operation

-It is an indispensable condition to drive LCD module within the limits of the specified voltage since the higher voltage over the limits may cause the shorter life of LCD module.

-An electrochemical reaction due to DC (direct current) causes LCD undesirable deterioration so that the uses of DC (direct current) drive should be avoided.

-Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD module may show dark color in them. However those phenomena do not mean malfunction or out of order of LCD module, which will come back in the specified operating temperature.

6.6 Storage

In the case of storing for a long period of time, the following ways are recommended:

-Storage in polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with not desiccant.

-Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping the storage temperature range.

-Storing with no touch on polarizer surface by any thing else.

6.7 Safety

-It is recommendable to crash damaged or unnecessary LCD into pieces and to wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.

-When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well at once with soap and water.